STRATASCAN

Geophysical Survey Report

Temple Balsall, Knowle
Solihull

for

Balsall Parish Council

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J2050

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REGISTERED IFA ORGANISATION

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LIST OF FIGURES

1 SUMMARY OF RESULTS

A gradiometer survey was carried out in an area proposed for a cemetery extension in Temple Balsall, near Solihull. The survey has identified little evidence for anomalies of archaeological origin. Possible archaeological cut features appear as disjointed weak positive anomalies that may be attributed to modern or agricultural activity. The majority of anomalies identified can be associated with agricultural activity.

2 INTRODUCTION

2.1 Background synopsis

Stratascan were commissioned by Balsall Parish Council to undertake a geophysical survey of an area outlined for a cemetery extension. This survey forms part of an archaeological investigation of the proposed area prior to development.

2.2 Site location

The site is located in the village of Temple Balsall approximately 5 miles southwest of Solihull at OS ref. SP 205 758.

2.3 Description of site

The survey area is approximately 0.7ha of recently harvested agricultural land with reasonably flat topography. A visible depression has been identified situated in the northeast corner of the survey area.

2.4 Geology and soils

The underlying geology is Triassic mudstone (British Geological Survey South Sheet, Fourth Edition Solid, 2001). The overlying soils are known as Wickham 2 soils which are typical stagnogley soils. These consist of slowly permeable seasonally waterlogged fine loamy over clayey, fine silty over clayey and clayey soils (Soil Survey of England and Wales, Sheet 3 Midland and Western England).

2.5 Site history and archaeological potential

No specific details were available to Stratascan. However, the potential for Anglo-Saxon and Early Medieval occupation is high. The settlement of Balsall is thought to have been established during the Anglo-Saxon period. During 1185 the manor of Balsall was donated to Roger de Mowbray and became one of many lands gifted by the Knights Templar. During this year documentary evidence suggests the existence of a well-developed manor with 640 acres of parcelled arable land (www.rps.gn.apc.org/leveson/history).

2.6 Survey objectives

The objective of the survey was to locate any features of possible archaeological significance in order that they may be assessed prior to the proposed extension of the nearby cemetery.

2.7 Survey methods

Detailed magnetic survey (gradiometry) was used as an efficient and effective method of locating archaeological anomalies. More information regarding this technique is included in the Methodology section below.

3 METHODOLOGY

3.1 Date of fieldwork

The fieldwork was carried out on the 19th August 2005. Weather conditions during the survey were overcast.

3.2 Grid locations

The location of the survey grid has been plotted in Figure 2 together with the referencing information. Grids were set out using a Leica 705auto Total Station and referenced to suitable topographic features around the perimeter of the site.

3.3 Survey equipment

The magnetic survey was carried out using a dual sensor Grad601-2 Magnetic Gradiometer manufactured by Bartington Instruments Ltd. The Grad601-2 consists of two high stability fluxgate gradiometers suspended on a single frame. Each sensor has a 1m separation between the sensing elements increasing the sensitivity to small changes in the Earths magnetic field.

3.4 Sampling interval, depth of scan, resolution and data capture

3.4.1 Sampling interval

Readings were taken at 0.25m centres along traverses 1m apart. This equates to 3600 sampling points in a full 30m x 30m grid.

3.4.2 Depth of scan and resolution

The Grad601-2 has a typical depth of penetration of 0.5m to 1.0m. This would be increased if strongly magnetic objects have been buried in the site. The collection of data at 0.25m centres provides an appropriate methodology balancing cost and time with resolution.

3.4.3 Data capture

The readings are logged consecutively into the data logger which in turn is daily down-loaded into a portable computer whilst on site. At the end of each job, data is transferred to the office for processing and presentation.

3.5 Processing, presentation of results and interpretation

3.5.1 Processing

Processing is performed using specialist software known as *Geoplot 3.* This can emphasise various aspects contained within the data but which are often not easily seen in the raw data. Basic processing of the magnetic data involves 'flattening' the background levels with respect to adjacent traverses and adjacent grids. 'Despiking' is also performed to remove the anomalies resulting from small iron objects often found on agricultural land. Once the basic processing has flattened the background it is then possible to carry out further processing which may include low pass filtering to reduce 'noise' in the data and hence emphasise the archaeological or man-made anomalies.

The following schedule shows the basic processing carried out on all processed gradiometer data used in this report:

1. *Despike* (useful for display and allows further processing functions to be carried out more effectively by removing extreme data values)

   Geoplot parameters:
   X radius = 1, y radius = 1, threshold = 3 std. dev.
   Spike replacement = mean

2. *Zero mean grid* (sets the background mean of each grid to zero and is useful for removing grid edge discontinuities)

   Geoplot parameters:
   Threshold = 0.25 std. dev.

3. *Zero mean traverse* (sets the background mean of each traverse within a grid to zero and is useful for removing striping effects)

Geoplot parameters:
Least mean square fit = off

3.5.2 Presentation of results and interpretation

The presentation of the data for each site involves a print-out of the raw data both as greyscale (Figure 3) and trace plots (Figure 4 and 5), together with a greyscale plot of the processed data (Figure 6). Magnetic anomalies have been identified and plotted onto the 'Abstraction and Interpretation of Anomalies' drawing for the site (Figure 7).

4 RESULTS

The anomalies identified within the gradiometer survey have been abstracted and interpreted into the following categories:

- Positive anomaly with associated negative response – ferrous object
- Linear anomalies – agricultural mark
- Weak positive linear anomaly – possible cut feature of archaeological origin
- Weak negative linear anomaly – weak evidence for structural remains
- Positive area anomaly – possible cut feature of archaeological origin
- Areas of magnetic disturbance – caused by nearby field boundaries or ferrous objects

Positive anomaly with associated negative response
A number of discrete positive anomalies with associated negative returns have been identified across the survey area with a higher concentration to the north. These anomalies are likely to be associated with near surface ferrous object of possible modern origin.

Linear anomalies –agricultural marks
A series of positive and negative parallel linear anomalies with an approximate northwest to southeast orientation have been identified across the survey area. These anomalies are likely to be associated with agricultural activity, possibly ploughing.

Weak positive linear anomaly – possible cut feature of agricultural origin
Positive linear anomalies possibly associated with archaeology have been identified mainly to the south of the survey area with a northeast to southwest orientation. Theses anomalies may represent possible cut features of archaeological origin. However, due to their weak and disjointed appearance, the anomalies may also be of agricultural or modern origin.

Two positive linear anomalies situated in the northeast corner of the survey area may be associated with a visible depression identified during the survey.

Weak negative linear anomaly – weak evidence for structural remains
A weak negative linear anomaly is situated in the west of the survey area in an approximate northeast to southwest orientation is. This anomaly may represent weak evidence for structural remains (possibly an earthen bank) possibly indicating a previous field boundary.

Positive area anomaly – possible cut feature of archaeological origin
Two positive area anomalies have been identified in the east of the survey area. One anomaly is situated on the northern limit of the survey and may be associated with the visible depression present in the northeast corner of the survey.

A further positive area anomaly is situated approximately midway along the eastern side of the survey area. This anomaly may represent a cut feature or pit of archaeological origin. However, due to its relatively low level response, a natural depression or a slighty waterlogged area may cause this anomaly.

Areas of magnetic disturbance – caused by nearby field boundaries or ferrous objects
Three areas of magnetic disturbance have been identified within the western side of the survey area. These anomalies are possibly caused by the nearby field boundaries and a large near surface ferrous object.

5 CONCLUSION

Little evidence for the presence of anomalies of archaeological origin has been identified within the survey area. A number of weak linear anomalies may be associated with archaeological activity, however these anomalies are weak and somewhat disjointed and could possibly be attributed to modern or agricultural activity. The majority of anomalies identified within the survey area can be associated with agricultural activity. Weak evidence for a possible field boundary has been identified in the form of a weak negative linear response.

APPENDIX A – Basic principles of magnetic survey

Detailed magnetic survey can be used to effectively define areas of past human activity by mapping spatial variation and contrast in the magnetic properties of soil, subsoil and bedrock.

Weakly magnetic iron minerals are always present within the soil and areas of enhancement relate to increases in *magnetic susceptibility* and permanently magnetised *thermoremnant* material.

Magnetic susceptibility relates to the induced magnetism of a material when in the presence of a magnetic field. This magnetism can be considered as effectively permanent as it exists within the Earth’s magnetic field. Magnetic susceptibility can become enhanced due to burning and complex biological or fermentation processes.

Thermoremnance is a permanent magnetism acquired by iron minerals that, after heating to a specific temperature known as the Curie Point, are effectively demagnetised followed by re-magnetisation by the Earth’s magnetic field on cooling. Thermoremnant archaeological features can include hearths and kilns and material such as brick and tile may be magnetised through the same process.

Silting and deliberate infilling of ditches and pits with magnetically enhanced soil creates a relative contrast against the much lower levels of magnetism within the subsoil into which the feature is cut. Systematic mapping of magnetic anomalies will produce linear and discrete areas of enhancement allowing assessment and characterisation of subsurface features. Material such as subsoil and non-magnetic bedrock used to create former earthworks and walls may be mapped as areas of lower enhancement compared to surrounding soils.

Magnetic survey is carried out using a fluxgate gradiometer which is a passive instrument consisting of two sensors mounted vertically either 0.5 or 1m apart. The instrument is carried about 30cm above the ground surface and the top sensor measures the Earth’s magnetic field whilst the lower sensor measures the same field but is also more affected by any localised buried field. The difference between the two sensors will relate to the strength of a magnetic field created by a buried feature, if no field is present the difference will be close to zero as the magnetic field measured by both sensors will be the same.

Factors affecting the magnetic survey may include soil type, local geology, previous human activity, disturbance from modern services etc.

Bibliography

www.rps.gn.apc.org/leveson/history - accessed 31st August 2005